



Attorney Docket No. IB 1366

Customer Number
08076

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Charles R. Piskoti et al.

Ser. No.: 09/518,989

| Group No.: 1754

Filed: 03/03/2000

| Examiner: S. Hendrickson

For: Carbon Based Thirty Six Atom Spheres

SUPPLEMENTAL APPEAL BRIEF

Commissioner for Patents
Mail Stop Appeal Brief – Patents
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Dear Sir:

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Applicant hereby submits this supplemental brief in support of an appeal to the

Board of Patent Appeals and Interferences from the last decision of the Examiner.

Applicants filed a notice of appeal on October 2, 2002. An appeal brief was filed on

April 2, 2003. An Advisory Action was mailed on June 17, 2003 (Paper No. 15).

Applicants responded to the Advisory Action on August 28, 2003. A non-final Office Action (Paper No. 18) was mailed on November 4, 2003, with a period for response set to expire February 4, 2004. Accordingly, a two month request for extension of time accompanies this Supplemental Brief. The Advisory Action of 6/17/03 (Paper No. 15) and the Office Action of 11/4/03 (Paper No. 18) are addressed below. Applicants do not believe that these papers respond to any of Applicants' arguments in the previously filed Brief. Accordingly, Applicants wish to pursue the Appeal as outlined in the brief filed April 2, 2003, and to the extent required by 37 CFR 1.193, request reinstatement of the appeal. For purposes of patent term extension, it must be pointed out that Applicants never withdrew the appeal. The Examiner never prepared an Examiner's Answer or formally stated that prosecution was re-opened. Nonetheless, in order to advance the case to a final decision by the USPTO, Applicants are filing the present supplemental brief to address issues raised by Papers No. 15 and 17. This is provided for in 37 CFR 1.193, which states:

(2) Where prosecution is reopened by the primary examiner after an appeal or reply brief has been filed, appellant must exercise one of the following two options to avoid abandonment of the application: (i) File a reply under Sec. 1.111, if the Office action is not final, or a reply under Sec. 1.113, if the Office action is final; or (ii) Request reinstatement of the appeal. If reinstatement of the appeal is requested, such request must be accompanied by a supplemental appeal brief, but no new amendments, affidavits (Sec. 1.130, 1.131 or 1.132) or other evidence are permitted.

This Supplemental Brief is cumulative and incorporates the arguments from the original brief. Appropriate transmittal and fee papers are transmitted herewith.

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1. Real Party in Interest

The real parties in interest are The Regents of the University of California and the United States Government.

2. Related Appeals and Interferences

There are no known related appeals (or interferences).

3. Status of Claims

Claims 1-10 stand finally rejected. Claims 11-18 were cancelled in the amendment after final dated October 2, 2002.

4. Status of Amendments

All Amendments have been entered, pursuant to Advisory Action 11/7/02.

5. Summary of Invention

Claim 1 recites a composition of matter comprising a solid state material consisting essentially of C36 fullerene molecules (page 3, lines 3-4). The claimed material is formed by a two step process. The C36 is first made in a mixture of many different mass fullerenes by an arc plasma technique (page 5, line 8 to page 6, line 9; mass spectrum of Fig. 1). The C36 is then separated from the other fullerenes (page 7, line 8 to page 8, line 12). The product being claimed is the purified or isolated solid state material consisting essentially of C36 (mass spectrum of Fig. 3). Thus while small amounts of C36 may have been formed previously in a carbon soot (similar to Fig. 1), the claimed purified C36 material (shown in Fig. 3) has not been previously produced.

Claims 2-4 recite the composition of Claim 1 with a crystal structure, and more particularly a hexagonal crystal structure (page 3, lines 4-7; page 8, line 20 to page 11, line 10), and covalent bonding (page 3, lines 9-11; page 8, lines 11-12). Claim 5 recites an article comprising a coating formed of solid state C36 material (page 3, lines 19-20; page 8, lines 7-8; original Claim 5). Claim 10 recites the composition of Claim 1 wherein the material is in the form of a film or a powder (page 3, lines 19-20; page 7, lines 21-22; page 8, lines 3-8).

Claims 6-9 are directed to the method of making the C36 solid state material. Claim 6 recites producing C36 rich graphite arc soot (page 3, lines 13-15; page 5, line 6 to page 6, line 9); removing higher order fullerenes from the soot, leaving a C36 containing residue (page 3, lines 16-17; page 7, lines 8-13); removing the C36 from the residue (page 3, lines 17-19; page 7, line 14 to page 8, line 8); and producing a solid

material from the C36 removed from the residue (page 3, lines 19-20; page 8, lines 21-22; page 9, lines 7-8).

Claim 7 further recites operating a carbon arc discharge in He at about 400 torr pressure (page 3, lines 13-15; page 5, line 14 to page 6, line 9). Claim 8 recites a dual solvent separation and Claim 9 specifies the solvents as toluene and pyridine (page 3, lines 15-19; page 7, lines 7-22).

6. Issues

Are Claims 1-10 unpatentable under 35 USC 112, first paragraph as failing to meet the written description requirement?

Are Claim 1-5, 10 unpatentable under 35 USC 102(b) over Stankevich?

Are Claim 1-5, 10 unpatentable under 35 USC 103(a) over Stankevich?

Are Claims 1-10 patentable under 35 USC 102(b)/103(a) over the Service Article and/or the *Nature* article discussed therein?

7. Grouping of Claims

For the 112 rejection, Claims 1-10 do not stand or fall together. Claims 1-5 and 10 to compositions/products are separately patentable from method Claims 6-9 since they do not depend on the particular arc processing parameters. Claim 7 is separately patentable from Claims 6, 8-9 since it includes the particular arc processing parameters that are the basis for the rejection.

For the 102/103 rejections, Claims 1-5 and 10 do not stand or fall together. Claim 1 is to the C36 solid state material. Claims 2-4 specify the C36 material with additional

features, Claim 5 is directed to a coating made of the C36 material, and Claim 10 is directed to C36 film or powder products, all of which may be separately patentable.

8. Arguments

Arguments made in view of Office Actions Subsequent to Original Brief

A. Background

The Final Office Action of 4/3/02 (Paper No. 8) from which this appeal was taken contains the following rejections:

1. Claims 1-18 were rejected as lacking enablement insofar as (a) there is no description of making the derivatives claimed and (b) the limitation of 400 torr of helium must be included in method claim 6 since the specification recites that "it is an important factor" in the production of the claimed C36 compositions.
2. Claims 15 and 16 were rejected under 35 USC 112 as indistinct.
3. Claims 1-5 and 10 were rejected as anticipated by, or obvious over, Stankevich et al.

In response, Applicants, in Amendment After Final dated October 2, 2002, cancelled Claims 11-18, rendering rejections 1(a) and 2 moot.

Next, in an advisory action dated 11/7/02 , the Examiner advised that the proposed amendment after final would be entered. The Notice of Appeal and Appeal Brief were then filed by Applicants.

B. Subsequent Correspondence

On June 17, 2003, another non-final Office Action was issued rejecting claims 1-10 as follows:

1. Claims 1-10 were again rejected as lacking enablement insofar as (a) there is no description of making the derivatives claimed and (b) the limitation of 400 torr of helium must be included in method claim 6 since the specification recites that "it is an important factor" in the production of the claimed C36 compositions.
2. Claims 1-10 were rejected (for the first time) under 35 USC 102(b), or, in the alternative, under 103(a) over the Service Article or the *Nature* Article discussed therein.
3. Claims 1-5 and 10 were again rejected as anticipated by, or obvious over Stankevich et al.

Applicants responded on 8/28/03 noting that the claims reciting derivatives were cancelled from the application; that the Service Article and *Nature* article are in fact directed to Applicants' own work, and that the Stankevich article is only theoretical and clearly conveys to the skilled artisan that the subject C36 compounds were not made and is therefore not enabling. A Declaration under 35 USC 132 (a "Katz declaration") accompanied the 8/28/03 response in order to remove the Service article as a reference. It should be noted that the *Nature* article to which Service refers in his commentary, which appeared in the same issue of *Nature*, in fact formed part of the provisional to which priority in the present case is claimed. The *Nature* article appeared June 25, 1998, the Service commentary appeared June 28, 1998, and the provisional patent application in

this case was filed March 5, 1999, making the applicable statutory section 102(a), not 102(b).

Thereafter, on November 4, 2003, the Examiner issued another non-final Office Action (Paper 18) repeating the rejections directed to the (now cancelled) derivative claims, the rejection directed to the 400 torr of helium limitation, and the prior art rejections based on the Service article and the Stankevich reference.

35 USC 112, first paragraph, written description rejection

On page 2 of both the first and final rejections the Examiner states that "as the specification recites the 400 torr of helium to be an important factor in C36 production, this feature should be incorporated into Claim 6, which does not recite how the production step is done." This is the basis for the rejection of Claims 1-10 under 35 USC 112, first paragraph as containing subject matter not described in the specification in a way to reasonably convey possession of the claimed invention. In the Advisory Action the Examiner further states that "the specification states pressures other than 400 gave no peaks."

It is submitted that the rejection is erroneous in that it focuses only on a specific example, and that the specification in its entirety shows possession of the broader invention as defined in Claim 6.

As stated in both prior responses, this limitation of 400 torr He is a specific detail of one particular embodiment of making C36 and is contained in dependent Claim 7. Claim 6 is a more generic claim to making C36 rich arc soot and separating the C36.

Claim 6 includes the step of "producing C36 rich graphite arc soot" which is the subject matter at issue. The general methods of making graphite arc soot are known, and in light of Applicant's disclosure, one skilled in the art can adjust process parameters such as pressure to enhance C36 production.

The response after final analyzed the description in the specification further:

As described on page 5, "Bulk quantities of C36 are produced by a modified Kratschmer-Huffman arc plasma technique. The technique has been modified to enhance the production of C36." As stated, under normal conditions, higher order fullerenes are produced with very little, if any lower order fullerenes. But, "as part of the invention, it has been determined that under certain conditions, C36 can be produced in relatively large amounts, e.g. 1-2% of the carbon soot." Thus one skilled in the art is lead to vary the process conditions from the normal conditions to increase C36 production.

Page 5 continues: "Optimum parameters for C36 production were determined in a helium environment arc discharge chamber originally designed for C60 production." Several specific parameters of this chamber then follow. This clearly is an illustrative example of one particular chamber, not the only chamber in which C36 could be made. For example arc discharge chambers could use another inert gas than He.

Page 6 states: "The synthesis of C36 is very sensitive to operational parameters, notably helium pressure." Tests from 50-1500 torr He are then described, with 400 torr being optimum. These tests are clearly on the chamber described on page 5. One skilled in the art would not expect all chambers to operate at the same parameters. The broader statement on page 6 clearly leads one skilled in the art to vary the operational parameters of any particular apparatus to find the optimum for C36 production.

As discussed fully in MPEP 2163 the basic inquiry for determining compliance with written description is whether the specification conveys with reasonable clarity to one skilled in the art that applicant was in possession of the claimed invention. *Vas-Cath, Inc. vs. Mahurkar*, 935 F.2d 1555, 1563-1564, 19 USPQ 2d 1111, 1117 (Fed. Cir. 1991)

Here the step at issue involves the production of C36 containing soot. The invention also involves the claimed steps of isolating the C36 from the soot. Thus it is clear that applicant would want to produce soot with as much C36 as possible. Since methods of producing carbon soot are *per se* known in the art, it is clear that applicant's invention could be applied to any C36 containing soot. And it is also clear that applicant indicates that the amount of C36 produced is very sensitive to process parameters.

Applicant could not possibly give the exact parameters for increasing C36 that would apply to every process for making soot since the process conditions could vary widely. Instead applicant gave a specific example which applicant used to make the C36 material that was analyzed, and described and claimed. But one skilled in the art could routinely vary process parameters to increase C36, and can tell that applicant was in possession of the broader claimed method.

It should be noted that Claim 6 is an original claim. As stated in MPEP 2163 much of the written description case law deals with whether the specification supports claims not originally in the application. There is a strong presumption that an adequate written description of the claimed invention is present when the application is filed. *In re Wertheim*, 541 F.2d 257, 263, 191 USPQ 90, 97 (CCPA 1976) original claims constitute their own description. *In re Koller*, 613 F.2d 819, 204 USPQ 702 (CCPA 1980) Since the original claims are part of the specification, they indicate that applicant considered the

claimed subject matter in his possession, and one skilled in the art would also recognize the claimed subject matter as in applicant's possession.

The Examiner's characterization of Applicant's argument as "C36 can be made using a well-known modification of a standard fullerene (C60) process" is erroneous. Applicant has argued that C36 can be made by a modification, as taught by Applicant and not already well-known, to a well-known standard C60 process. Thus it is the standard process that is well-known, not Applicant's modification thereto to increase C36. Therefore the conclusion that Applicant appears to admit that the present process is obvious over the known prior art is baseless.

Furthermore, even if the step of producing a C36 rich soot were known, it would benefit applicant. The claimed process includes additional steps for first removing higher order fullerenes, then removing C36, and finally forming a solid from the C36. The Examiner has not shown any of these steps in the prior art. Thus even if the C36 producing step is entirely conventional, the claim as a whole is still patentable.

The Examiner states that Claim 6 does not recite performing an arc process. Claim 6 recites "producing ... arc soot." This is one way of reciting the step. How else is "arc soot" produced except in an arc?

Thus it is submitted that the rejection is erroneous because the written description requirement for the broader claims is satisfied. The Examiner has focused only on the most specific information in the specification, e.g. page 6, lines 6-7, to the exclusion of the more general information. Even page 6, lines 6-7 can be taken to teach running the process at a series of different pressures to find the optimum. It would be routine for one skilled in the art to do so in light of applicant's teachings.

The burden of proof on written description is on the Examiner (MPEP 2163.04).

The Examiner must show by a preponderance of evidence why one skilled in the art would not recognize in applicant's disclosure a description of the claimed invention. The Examiner has not done so. He merely has stated that a particular pressure is required in the claims. He has provided no evidence to rebut the presumption that the description as filed is adequate nor has he rebutted any of applicant's arguments as to the broader disclosure. He has not shown why one skilled in the art would not consider original Claim 6 as showing possession of the invention as claimed therein.

Claims 1-10 do not all stand or fall together because they do not all recite the processing step at issue. Claims 1-5, directed to C36 compositions and products are separately patentable because they do not include the processing step at all and thus it is irrelevant whether the method of Claim 6 meets the written description requirements.

Claims 6-9 do not stand or fall together because Claim 7 includes the 400 torr He limitation at issue and thus should be allowed even if Claims 6, 8-9 are not.

35 USC 102(b) rejection over Stankevich

Claims 1-5 and 10 are rejected under 35 USC 102(b) as anticipated by Stankevich. The Examiner states that Stankevich teaches C36 on p. 172 and that "As its properties are reported, it appears to have been made and isolated."

The rejection is erroneous because Stankevich describes theoretical calculations and does not describe C36 that was made or isolated.

As stated in the prior responses, the Examiner's characterization of Stankevich is clearly erroneous. The paper is a purely theoretical paper, with no measured properties reported, and no evidence that C36 was made or isolated. The Examiner was requested to

show any part of the paper where any experimental work leading to Table I is described and has not done so. There is not a scintilla of evidence of experimentation since none was done.

The Abstract states that carbon cluster structures were studied by "topological and valence approaches" which are well-known theoretical methods as clearly shown on p. 170-171. The topological method description on p. 170 is purely mathematical, i.e. "the secular equation ... is subdivided into six equations" and "Calculation ... is reduced to the eigenvalue problem for the six complex matrix Hamiltonians." Likewise the description on p. 171 of the valence method is purely mathematical, i.e. "... have been calculated by the MNDO/PM3 method." The first three lines of p. 169 state that cited work "stimulates further modeling of various carbon cluster structures and prognosis of their properties." Thus the values given in Table 1 on p. 172 are purely theoretical calculations, i.e. the prognosis from the theoretical models.

The Examiner's statement that Stankevitch is no more "theoretical" than Applicant's disclosure and also contains "hard" data supporting actual experimentation is erroneous and baseless. Applicant has shown real experimental results, e.g. the mass spectra of Figs. 1, 3 and the NMR spectra of Fig. 5B. Applicant has also described the apparatus (Figs. 2, 4) and tests involving different He pressures in a particular chamber to determine optimum pressure for that chamber. Stankevitch has no experimental data whatsoever since all values were calculated from theoretical models.

There is also no suggestion of forming coatings as in Claim 5. Claim 10 is directed to the film or powder form of the C36 material which is also not suggested.

To anticipate a claim, the reference must teach every element of the claim.

Verdegaal Bros. vs. Union Oil Company of California, 814 F.2d 628, 631, 2 USPQ 2d 1051, 1053 (Fed. Cir. 1987). To constitute enabling prior art one of ordinary skill in the art must be able to make or synthesize (MPEP 2121.02). The mere naming of a compound in a reference, without more, cannot constitute a description of the compound.

In re Hoeksema, 399 F.2d 269, 158 USPQ 596 (CCPA 1968)

Here the Examiner relies on a reference (Stankevich) which clearly does not show how to make the C36 containing soot, let alone isolate it. Applicant has shown that at most the prior art could make a soot containing some C36 as shown in Fig. 1. But the product claimed in Claims 1-5 and 10 is that shown in Fig. 3, the purified or isolated solid state form of C36. Stankevich fails totally as an enabling prior art reference since it does not show that C36 material existed prior to applicant's invention. Stankevich merely provides a theoretical drawing of a 36 atom molecule, without any teaching of how to make it.

Thus it is submitted that the rejection is erroneous because Stankevich does not show the existence of C36 material at all and provides no method of making the theoretical molecule shown. Further Claims 1-5 and 10 do not stand or fall together since Claims 2-5 and 10 contain additional features which are not shown in Stankevich and must be found in the reference to support a 102 rejection. Claims 2-4 recite solid state material with various crystal structures or bonding. They would be separately patentable over a reference that merely showed the C36 molecule. Claim 5 is directed to an article of manufacture comprising a coating made of C36. This use of C36 to form a coating is not shown in Stankevich. Claim 10 is directed to C36 solid state material products in

film or powder form. Again there is no showing of this limitation in Stankevich. Thus Claims 5, 10 are each separately patentable even if the basic C36 molecule is shown in Stankevich.

35 USC 103(a) rejection over Stankevich

Claims 1-5 and 10 are rejected under 35 USC 103(a) as obvious over Stankevich.

The rejection is erroneous for the reasons given above against the 102 rejection, i.e. that Stankevich does not show how to make the claimed C36 solid state material, but only shows a theoretical molecule, and does not provide any additional reference which could be combined with Stankevich to show how to make the material. Not only is it necessary to produce a C36 containing soot, but it is necessary to separate the C36 from the other materials in the soot, as applicant has shown. The Examiner has provided no basis whatever to conclude that this separation is already known in the prior art or obvious therefrom.

Thus it is submitted that the rejection is erroneous because Stankevich fails to support either a 102 or a 103 rejection. Claims 1-5 and 10 do not stand or fall together for the reasons given above for the 102 rejection since they recite further details or forms of C36 material that are not obvious from a reference which merely shows a C36 molecule.

The new 102(a)/103(a) rejection over the Service article and/or the *Nature* article discussed therein

As pointed out in the response immediately following the raising of this rejection (after the filing of the present appeal), the Service article is a commentary published in *Nature*

on June 16, 1998 in order to celebrate the notable achievement of the present applicants in the first preparation of a C36 composition. That breakthrough work had just been published, by the present inventors, in *Nature*, on June 25, 1998. The Service article states “Now, researchers at the University of California, Berkeley, report in this week’s issue of *Nature* that they’ve isolated a smaller fullerene sphere that contains just 36 carbon atoms. Tests on the *new* Fullerene show that it is far more chemically reactive than its larger cousin, which could make it easier to fashion into everything from high-temperature superconductors to high-strength materials.” (emphasis supplied).

Thus, it is clear from the face of the article that the invention was not “described in a printed publication, in this or a foreign country, before the invention thereof by applicant for patent,” as required by 35 USC 102(a) (emphasis supplied). Since the article is not prior art under 35 USC 102(a), it is not available as a reference under 35 USC 103(a). MPEP 716.10 sets forth the requirements for establishing that a printed publication is in fact attributable to applicants. The MPEP states that “it is incumbent upon the applicant to provide ‘a satisfactory showing that would lead to a reasonable conclusion that [applicant] is the ...inventor’ of the subject matter disclosed in the article and claimed in the application.” A satisfactory showing was made by Applicants’ Declaration under 37 CFR 1.132. The Examiner accepted applicants Declaration and showing regarding the *Nature* article. The Service article is quite explicitly and plainly a commentary on the work reported in the *Nature* article and should be withdrawn as a reference.

9. Conclusion

Accordingly, the rejection of claims 1-10 should be reversed and the present case passed to issuance.

10. Appendix: Claims on Appeal

1. A composition of matter comprising a solid state material consisting essentially of C₃₆ fullerene molecules.

2. The composition of Claim 1 wherein the solid state material has a crystalline structure.

3. The composition of Claim 2 wherein the crystalline structure is hexagonal.

4. The composition of Claim 1 wherein the molecules are covalently bonded to each other.

5. An article of manufacture comprising a coating formed of a solid state C₃₆ material.

6. A method of making a solid state C₃₆ fullerene material, comprising: producing C₃₆ rich graphite arc soot;

removing higher order fullerenes from the soot, leaving a C₃₆ containing residue;

removing the C₃₆ from the residue;

producing a solid material from the C₃₆ removed from the residue.

7. The method of Claim 6 wherein the C₃₆ rich soot is produced by operating a carbon arc discharge in a helium atmosphere at about 400 torr pressure.

8. The method of Claim 6 wherein the higher order fullerenes are removed using a first solvent and the C₃₆ is removed using a second solvent.

9. The method of Claim 8 wherein the first solvent is toluene and the second solvent is pyridine.

10. The composition of Claim 1 wherein the solid state material is in the form of a film or a powder.

Respectfully submitted,

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